AN APPARATUS AND METHOD FOR TWO-DIMENSIONAL ELECTRON GAS ACTUATION AND TRANSDUCTION FOR GAAS NEMS

Abstract of the Disclosure

A doubly clamped beam has an asymmetric piezoelectric layer within the beam with a gate proximate to the beam within a submicron distance with a gate and beam dipole. A suspended beam is formed using a Cl_2/He plasma etch supplied at a flow rate ratio of 1:9 respectively into a plasma chamber. A parametric amplifier comprises a NEMS signal beam driven at resonance and a pair of pump beams driven at twice resonance to generate a modulated Lorentz force on the pump beams to perturb the spring constant of the signal beam. A bridge circuit provides two out-of-phase components of an excitation signal to a first and second NEMS beam in a first and second arm. A DC current is supplied to an AC driven NEMS device to tune the resonant frequency. An analyzer comprises a plurality of piezoresistive NEMS cantilevers with different resonant frequencies and a plurality of drive/sense elements, or an interacting plurality of beams to form an optical diffraction grating, or a plurality of strain-sensing NEMS cantilevers, each responsive to a different analyte, or a plurality of piezoresistive NEMS cantilevers with different IR absorbers.